THE AIR LINE PILOT

DECEMBER, 1959

Season's Greetings

In Constant Memoriam

"To fly west, my friend, is a flight we all must take for a final check."

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Eyre, Lloyd—UAL
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THE AIR LINE PILOT

DECEMBER, 1959
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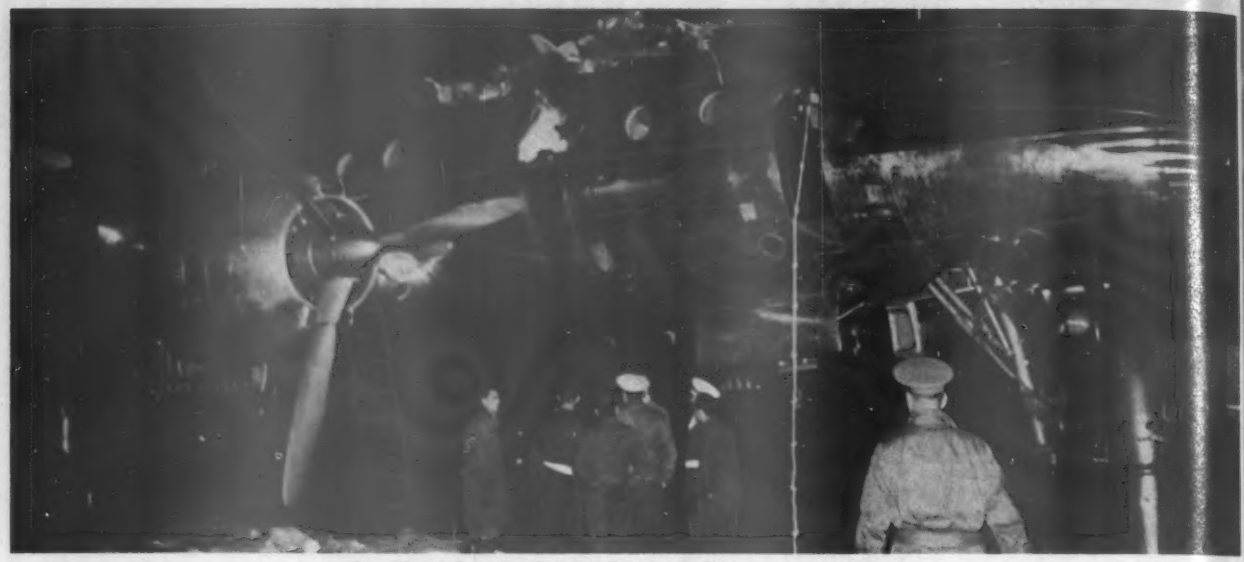
On The Cover

To all our members and friends:

The Star on the cover of this issue is symbolic of the Christmas Spirit—it is also a symbol of the bright North Star which is the Omnipresent "Guardian" of the pilot. It watched over the first efforts of man to fly as it now watches over the sure, proud flight of the pilot in the newest of jets.

Each day man steps closer to this light. And the whisper of the wings that bear his advance, testify for him in the book of history, for they mirror his thoughts and his very soul. For the pilot is a pioneer—and always will be. And trodding the path he blazed will come others, seeking their star and...touching it when they too take the peaceful journey west.

From the Association to all our members and many friends, we extend our warm greetings for a Holy Christmas and a Happy New Year.



This Plane Survived A Mid-Air Collision — Most Don't.

Human Aspects of Mid-Air Collision Prevention

By

Anchard F. Zeller, Ph.D.

Reprinted From An Article In Aerospace Medicine

IN World War I, when relatively large numbers of aircraft were being flown in the same general area at the same time, the first major mid-air collision recorded occurred on August 17, 1917. To those who are accustomed to thinking of mid-air collisions as being only recently significant, it is of some interest that in 1918 there were forty-five mid-air collisions of which forty-two resulted in fatalities.

During 1958 there were thirty-three mid-air collision accidents experienced by the U. S. Air Force. This represents a decrease in the number as well as the rate, computed on the basis of flying hours, of mid-air collisions over the previous several years (Table I). For the first time since 1950, it also represented a definite decrease in the portion of all Air Force aircraft accidents which were mid-air collision accidents (Table II). When it is considered that the ratio of mid-air collision accidents to all aircraft accidents in the Air Force doubled between 1950 and 1957, the importance of this is emphasized.

In spite of this improved record, the significance of even one major mid-air collision accident is such that continued effort toward the elimination of this type of accident is required. As is the case with any type of accident, prevention depends upon an identification of the circumstances surrounding the accident and of the causes. Evaluation of Air Force experience indicates that, to a great extent, the mid-air collision problem is a self-contained one. Although a few serious occurrences have involved Air Force and non-Air Force aircraft, these occurrences have been relatively rare. Since the Air Force was established as a separate service in 1947, only 18 accidents have involved Air Force and civilian aircraft. Within the Air Force, great strides have been made in the reduction of formation-type, mid-air collision. The more critical aspect of the problem which remains is the collision of aircraft which were not being operated in association with each other. Air Force accident

The mid-air collision problem, says the author, is rooted in the equipment, the setting & human capabilities. His conclusions: they combine to make see and be seen obsolete, and risky.

experience shows that approximately four out of five of the mid-air collisions occur under visual flying rules (VFR) in daylight conditions. Most are within twenty miles of an airfield and occur at relatively low airspeed.

When the assessed causes of the accidents are considered (Table III), it is apparent that by far the greater number of these are related to either errors of omission or commission on the part of the pilot. In order of frequency, these errors relate to failure to see the collision object, a misjudgment of distance, or failure to take corrective action in time to avoid a perceived aircraft. Other errors are committed by such persons as instructors, flight leaders, and supervisory and ground support personnel. Due to the very nature of mid-air collisions, in a large number of instances, the actual causes are undetermined because of the extremely destructive nature of such accidents. The remaining mid-air collisions are the result of some type of unsafe condition, but during a recent five and one-half year period only two mid-air collision accidents fell into this category.

The immediate conclusion that would be drawn from an evaluation of these facts would suggest that the human participant was at fault in mid-air collision type accidents. A careful evaluation of the situation, however, would suggest that this obvious conclusion should be examined more critically in the light of the basic limitations inherent in the equipment, the setting, and in the man himself.

Human Factors

In any human activity, considered in conjunction with the operation of a piece of equipment, there are three sequential steps which must be followed. First, perception which involves seeing and hearing, but also an understanding of the meaning of the stimulus perceived. The second step in the sequence involves decision. Once perception has been accomplished, it is necessary that the information received be integrated with other information and past experience, and a decision made as to the course of action to be followed. The third step is the logical culmination, namely, the performance of some action. In other words, response. This perception-decision-response cycle is always involved. It is an interesting coincidence that in order of frequency the errors committed in mid-air collisions fall roughly into the same sequence, that is, the greatest number of errors are related to perception, the second greatest to decision and the third greatest are related to inappropriate decisions and judgment and responses. Consideration of this sequence of activity indicates that there are finite time lapses associated with each step, and that there are factors which can interfere with the optimal development of each step of the sequence.

When perception is considered, it is obvious that in order for an aircraft on a collision course to be observed, it is necessary for the pilot to be looking outside of the cockpit. By the very nature of the pilot's task, there are occasions when the requirements of flying make this impossible. The monitoring of instruments and the adjusting of controls often require that attention be directed inside the cockpit.

Information developed through research studies indicate, for example, that the average time taken to read a standard Air Force aircraft altimeter is seven seconds. Incidental to this, it is pointed out that one-sixth of the readings are in error and that one-tenth are in error by as much as 1,000 feet. During this seven seconds a pilot in a standard jet penetration from 20,000 feet at 350 mph, in a rate of

From the U. S. Air Force Directorate of Flight Safety Research, Norton Air Force Base, California.
Presented on April 27, 1959, at the 30th annual meeting of the Aero Medical Association, Los Angeles.

TABLE I. Mid-air Collision Rates per 100,000 Aircraft Hours in U. S. Air Force and Air National Guard, 1947-1958

Year	Major Collisions Rate	Fatal Collisions Rate
1947	0.80	0.40
1948	0.86	0.36
1949	0.83	0.47
1950	0.63	0.33
1951	0.71	0.32
1952	0.82	0.45
1953	0.74	0.38
1954	0.71	0.34
1955	0.58	0.28
1956	0.59	0.34
1957	0.55	0.32
1958	0.38	0.24

TABLE II. Relative Frequency of Major and Fatal Mid-air Collisions in U. S. Air Force and Air National Guard 1947-1958

Year	Frequency per 1,000 Major Accidents	
	Major Collisions	Fatal Collisions
1947	18	9
1948	21	9
1949	23	13
1950	17	9
1951	22	10
1952	29	16
1953	30	15
1954	35	17
1955	34	16
1956	40	23
1957	40	23
1958	36	22

TABLE III. Percentage Distribution of Most Frequent Primary Pilot Factors Occurring in Mid-air Collision Accidents in U. S. Air Force and Air National Guard 1953-1958

Nature of Factors*	Per Cent
Failed to see other aircraft	
In flight	46
In pattern	3
Misjudged distance	23
Did not change flight pattern in time to avoid collision	19
Used improper crossover or crossunder technique	9
Total	**100**

*These factors were represented in 75 per cent of all mid-air collisions.

descent of 5,200 feet per minute, travels 3,600 feet along a flight path and descends 600 feet vertically. Any shift from one instrument to another within the cockpit takes time. The actual lateral movement of the eyes will consume five one-hundredths of a second while traveling through 20 degrees. If a person looks into the cockpit, looks outside, and then re-focuses on the instrument panel a minimum of two seconds has elapsed. Other activities are even more time-consuming. The changing of radio channels which requires complete concentration inside the cockpit, the monitoring of the fuel system which requires selection of various tanks, re-setting altimeters, and various other activities are examples. These are normal activities associated with visual flight. When an instrument flight plan must be followed, the time spent monitoring the instruments is much greater, even under VFR conditions. Under emergency or anticipated emergency conditions, even more time is spent looking inside the cockpit.

Even if the pilot is looking outside of the cockpit, there are a number of factors which contribute to failure to observe a collision object. First, the available space which can be scanned is restricted to the area which can be observed through the windshield or canopy. Although consistent efforts have been aimed at improving the possible field of vision, even a casual survey of modern aircraft will reveal the limited degree to which the objective has been attained.

Another limitation relates to the resolving power of the human eye. Even though vision is unobstructed and the object is clearly in focus, an aircraft, particularly a fighter aircraft, on a head-on collision course, presents a very small target on which to fixate, and the distance at which actual visual identification is possible is limited to a few miles at the most. When the image received is clear and distinct, the minimum visual angle at which any type of form other than a dot can be perceived is aproximately one minute of arc. Depending upon atmospheric conditions and the location of the sun, this relatively short distance may be even further reduced. Still further restriction occurs if the object is not directly in focus. Stimulation of the periphery of the eye does not result in perception nearly as readily as stimulation of the central portion. Even when a peripheral stimulus is noted, it may take several tenths of a second to bring this into clear focus to the point that recognition is possible.

At high altitudes another peculiar visual phenomena, which is not so well recognized, becomes important. This is the tendency of the eye, when looking into space with no object on which to fixate, to automatically focus only a few feet in front of the individual. Efforts to overcome this, and to look into the distance, only aggravate the problem. At extremely high altitudes, where there are no concrete objects upon which to fixate, or in haze conditions which result in the same restriction of possible external stimuli, this condition exists.

Another factor is related to scanning habits and division of attention. Even under optimal conditions, when the amount of air space which can be seen is related to the human visual field, the actual probability of seeing a collision object in time to avoid it, particularly when the rate of closure is extremely high, is small. The decision which the pilot must make, once an object is perceived, can be stated simply as the decision of whether or not a collision course has been established and the corollary decision of what to do if it is determined that one has. This simple statement, however, disguises the extreme complexity of both of these decisions. When straight line courses are involved, the problem of determining whether or not another aircraft is on a collision course is relatively difficult but this difficulty is magnified many times when either or both of the aircraft involved are flying in other than straight line courses. The problem of judging rate and of projecting curvilinear paths by visual reference to open space is almost outside the pilot's capability. Because of the high rate of closure often involved, which makes it necessary for the evaluation to be made at relatively great distances if a collision is to be avoided, this difficulty is enhanced.

The problem of decision as it relates to the course of action to be followed is also far from simple. This decision must be made rapidly and accurately because, in most instances, once the pilot has committed his aircraft to some type of maneuver, insufficient time remains for major correction.

The problem of teaching an individual to make quick and accurate decisions in emergency situations is one which has concerned those responsible for training for many years. One of the best training methods, of course, is actual experience. Unfortunately, actual experience as regards mid-air collision is often gained on a disastrous one-time basis and even when this is not the case, there are so many variables involved that predetermined routine courses of action are difficult to devise in any meaningful manner. Even under the most optimal circumstances, decision involves some finite time which must be considered in the total activity sequence.

The problem of response is the problem of efficient technical operation of the aircraft, and hence is related to the degree of inherent ability, adequacy of training, amount of experience, and an accurate evaluation of the specific circumstance which makes the response in question appropriate. Not only the perception and decision portions of the perception-decision-response sequence involve time delays, the response itself is a time-consuming process. In the simplest case, the response time lag can be restricted to the actual neural transmission time and the time involved in muscular contraction. In practice this type of analysis is inadequate because the control of an aircraft involves more complex types of manipulations.

Another type of response which must be considered is related to the functioning of the aircraft itself. This machine response-time consists of the time required for the movement of the controls and control surfaces, and the time required for the modified airflow to produce sufficient deviation of the aircraft from the original flight path for a collision to be avoided. Under relatively optimal circumstances the minimum perception-decision-response lag, together with the machine lag, has been determined to be about five seconds. This theoretical minimum, as is readily apparent from the preceding discussion, can extend to an indefinite time, and in practice is certainly several times the possible minimum. Even using the assumed minimum figure, two aircraft on a collision course at a combined rate of closure of 1,200 mph will be a mile and a half apart five seconds before collision. Under optimal circumstances a collision could be avoided. At these speeds, if the aircraft were closer together than this before one of the pilots observed the other aircraft on a collision course, a collision would be essentially inevitable.

Limiting Factors

The discussion to this point has been concerned primarily with normal universal human limitations and standard operating conditions. Unfortunately, there are many adverse circumstances which can lead to a further degradation of the efficiency with which the perception-decision-response sequence is initiated and hence increase the probability of mid-air collisions. Because,

up until now at least, perception of a collision object is dependent upon looking outside the cockpit, aircraft design, particularly of the cockpit, which increases the complexity of the pilot's task or the amount of time which must be sent looking inside the cockpit, will reduce the outside scanning time and increase the probability of a collision.

Another important consideration is the amount of background training and experience which the individual pilot has in the specific equipment. With training and experience, many functions which originally were performed on a visual basis become semi-automatic and are performed more and more on the basis of tactile rather than visual cues. The pilot with limited experience, or one in a strange cockpit, must use visual stimulation to adequately perform his cockpit tasks. This automatically increases the probability of a collision.

Although man apparently can do many things at one time, evidence unequivocally indicates that in actual fact he can attend to only one thing at a time, although he may alternate his attention very rapidly and hence appear to be attending to a multipilicity of tasks within a restricted time period. The requirement for additional concentration on any facet of the operation must result in a reduction in the time available for attention to other facets.

Other limiting factors are boredom and fatigue. As was indicated, the task must not be too complex or the time available for the scanning operation is reduced. On the other hand, the pilot's task must not become too simple because lack of activity in progress is conducive to general boredom and inattention due to drowsiness or preoccupation. The result is a degradation of the general scanning habit patterns. Under these conditions the proximity of another aircraft may not be noted until the critical point has been reached, or in fact may not be noted at all, until a collision results. Flights of long duration are conducive to fatigue with a general degradation in the efficiency with which all tasks are accomplished.

Special hazards, which are almost unique to the pilots of aircraft, are those associated with oxygen deficiency and explosive decompression. Under extreme circumstances, either can lead to unconsciousness but before this point is reached there is general impairment of all aspects of the perception-decision-response sequence as a result of an inadequate supply of oxygen within the bloodstream. Although conscious, the pilot may be and often is unaware of his impairment. Related hazards are those resulting from carbon monoxide or from toxic poisoning. These all lead to impaired efficiency.

Another less defined type of hazard which, because of the impairment of efficiency associated with it is important, is that associated with the pilot's mental state. Excessive concern with problems of personal interest can lead to incorrect accomplishment of essential flying duties, particularly during periods when the immediate demands are at a minimum. This can result in inattention to outside traffic and to a resultant accident.

One other factor deserving mention is the relation of age to general performance ability. Although increased age is generally associated with increasing experience, it is also associated with a deterioration of certain bodily functions, particularly those related to rapid precision activity. There is a slowing of reflex time, slowing of accommodation of the eyes, a general deterioration in the ability to attack new and novel situations and ultimately, in advanced age, marked deterioration in abstract mental ability and physiologic resistance. The degree to which this factor is related to mid-air collisions cannot be evaluated but it is certainly a factor to be considered.

Physiologic incapacitation regardless of age is also always a potential limiting factor.

Although the Air Force, and other agencies, have experienced a large number of mid-air collisions in the past, the percentage has been relatively small in comparison to total aircraft accidents. To a great extent this reflects exposure to this type of accident. As more and more aircraft are using a given air space the statistical probability of a mid-air collision increases. The history of the Air Force, in terms of the relative portion of all accidents which are mid-air collision accidents, bears out this anticipated trend. What was a dramatic but relatively infrequent occurrence thus became, with time and increasing traffic density, a devastating and frequent one. This called for critical action, although public awareness of this action followed some of the more highly publicized accidents within the past year, actual remedial efforts within the Air Force, as well as elsewhere, have long been established and new corrective programs are continually being developed.

Solutions

As was indicated, the findings from accident investigation would tend to imply that since mid-air collisions are the result of pilot errors, remedial action should be aimed directly at the pilot. The preceding analysis, however, indicates the fallacy of this argument and documents theoretically what has been demonstrated in fact, namely, that many mid-air collisions are the result of the pilot finding himself in a situation which exceeds the capability of the man and machine as currently constituted. Although added emphasis upon training pilots in various procedures and techniques can undoubtedly result in the elimination of many mid-air collisions, an adequate solution must aid the pilot, both through information supplied directly to him and through control procedures, to guarantee aircraft separation, so that the potential mid-air collision situation does not develop.

It has been suggested that multiple pilots or additional scanners, when this is possible, will serve to reduce mid-air collision accidents. This is based on the assumption that two pairs of eyes can scan more adequately than one. This is certainly the case, and accident histories demonstrate that aircraft with more than one pilot, particularly those with a side-by-side seat configuration are involved in fewer mid-air collisions than other types of aircraft. It must be kept in mind, however, that factors other than the multipility of pilots are operating to produce this improvement. The human limitations discussed are as applicable to persons as to one so that any additions in terms of scanner personnel can be expected to eliminate only a fraction of the mid-air collision accidents.

A remedial approach can be expected to be of value. Modification of aircraft to increase visibility and improvement of design of the cockpit, to reduce the complexity of the pilot's task, would decrease the probability of mid-air collision. Aerodynamic considerations seem to limit progress in the visibility area. The process of cockpit simplification and standardization is one which has received, and is receiving, a great deal of attention. Changing aircraft performance characteristics, with the consequent requirement for new and different instruments and controls, make this a difficult task.

Various solutions have been suggested aimed at increasing the conspicuousness of aircraft. These would appear to be of some value, especially in relation to aircraft at relatively low speeds in areas of high traffic density, such as near an airfield. It should be pointed out, however, that the actual possible space available for the pilot to scan is restricted and that air-

(Continued on Page 9)

I've blessed my wings a thousand times
for where they've carried me—
high up the ladders of the wind—
far out across the prairies of the sky
to lands my fathers never knew
and shores my kindred never trod—
threading the corridors of tempted cloud
out and away beyond accustomed sights
and sounds and creeds and breeds.

I've blessed my wings a thousand times
because of doors they held ajar
to aspirations of a seeking youth—
the vistas and horizons that receded endlessly
though I pursued them furiously—
the ceaseless challenge to orbit beyond
the perimeters of the antiquated
and weary traditions and dogmas
which anchor men to the bloody past.

I've blessed my wings because they are
the physical evidence of the modern concept
that to mankind nothing is impossible—
that creation is his heritage and that
the language of God is articulate
and intelligible in the laws of the universe.

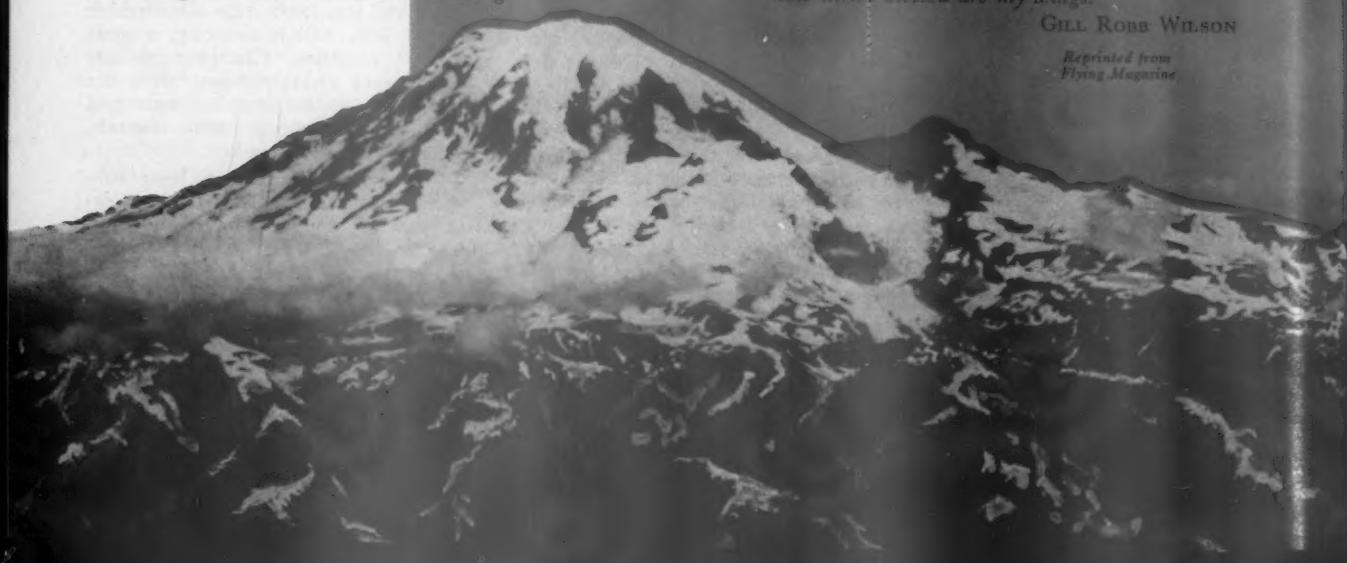
Time is not the measure of rising and setting suns
but the processing of experience from which
the truth emerges bold for all who run to read.
For all of this and more beside
which points to the stars and beyond,
I've blessed my wings a thousand times.

But there is a nearer ecstasy!
The wings that bear one home—the song
of the engine when the homebound leagues
fold the homesick heart in their embrace—
the joy of letting down to the place
the heart has never left—the thrill
of returning to the one spot on earth
beloved above all others—home!

And, if it be "Home for Christmas,"
how thrice blessed are my wings.

GILL ROBB WILSON

Reprinted from
Flying Magazine



(Continued from Page 7)

craft approaching from many angles may not be seen no matter how conspicuously marked. It is also relevant to consider that accident histories indicate that most collisions of the non-formation type occur when one or more of the aircraft were following a curvilinear course immediately prior to the accident, which makes judgment regarding possible collision extremely difficult.

The use of high intensity lights, especially if these can be designed to furnish directional information, should also be useful, particularly for night operation. Empirical evidence indicates, however, that over four-fifths of all mid-air collisions occur during daylight hours, under good visibility conditions so that unless lights can be developed which have marked attention-provoking characteristics under daylight conditions, the prevention potential of anti-collision lighting is limited.

Smoke puffs and vapor trails have been evaluated. Under certain cruise conditions away from congested traffic these have some limited value. On well-traveled airlines, however, or more particularly in the congested areas around terminal points, the multiplicity of such trails might well lead to confusion and it is conceivable that the haze condition created could present its own problems.

Traffic control appears to offer the most profitable immediate solution to the mid-air collision problem. A guarantee of positive separation of all aircraft should be of great value; again, however, positive control of traffic is dependent upon a number of factors. These include the capability for such control and the willingness for all traffic to be controlled. The development of positive traffic control, even for all commercial and military aircraft, is dependent upon facilities and equipment not yet available. The control of certain other types of aircraft does not appear to be prospective because of the lack of willingness upon the part of some groups to subscribe to full control. Furthermore, there are some types of traffic, including many test and tactical flights, which cannot be subject to full control.

Discussion

The development of adequate anti-collision equipment, in the form of either a proximity warning indicator or a true anti-collision device, remains in an open status. Caution should be exercised in implementing and adopting any of the devices in this category. It should be borne in mind that the pilot needs very specific, easily-assimilated information in order to use it for mid-air collision avoidance. This information must be presented meaningfully and in time, and must include at least direction, bearing and rate of closure, and take into consideration all aircraft in the immediate vicinity. Presenting this information by means of a visual display, which requires cockpit attention and interpretation on the part of the pilot, may well aggravate rather than alleviate the problem. True anti-collision avoidance information fed into the auto-pilot system may add excessive weight, and hence be unacceptable for many types of aircraft.

An over-all consideration of the human aspect of mid-air collisions demonstrates that the apparently obvious conclusion, attributing almost all such accidents to pilot error, is incorrect. They are the result of a complex situation the demands of which, in many instances, exceed the basic capabilities of the pilot. If further corrective measures are not instituted, it can be predicted that mid-air collision accidents will increase because of the great probability of increased air traffic. The remedial measures under consideration will result in a decrease in accidents in direct proportion to the degree to which they guarantee aircraft separation, or assist the pilot in perceiving, deciding and acting as these functions relate to collision avoidance. All of the currently suggested measures have limitations which will preclude complete effectiveness. In implementing any measures aimed at a reduction of mid-air collision accidents, caution should be exerted to guarantee that the corrective measure applied does not in itself create other problems which might lead to an increase in accidents in general.

Summary

Since its first major mid-air collision in 1917, the U. S. Air Force has directed efforts toward the prevention of accidents of this type. These efforts have involved selection and training of personnel, improved external control measures, cockpit redesign for simplicity and better visibility, methods for increasing the conspicuousness of approaching aircraft and equipment designed to give the pilot additional information by means of cockpit presentations which indicate approaching aircraft. Particularly important has been control of collisions between Air Force and civilian aircraft. In its history as a separate service, from 1947 to the middle of 1959, only eighteen such accidents have occurred. Until 1958, none had involved commercial transport, passenger-carrying vehicles.

An evaluation of the mid-air collisions which have occurred indicates that, to a great extent, they are the result of a combination of human limitations and situational factors. Present control and assistance efforts are not adequate for the guaranteed prevention of all collisions. Although flying on a see-and-be-seen basis is currently necessary, it should be recognized that due to the limitations of man and of the equipment now available, such flying involves a risk which will increase with greater traffic density. Accident evaluations do indicate, however, that full utilization by all users of the airspace of all prevention methods available at present can result in a decrease in mid-air collision accidents. The development of advanced control and warning equipment will further this end.

Failure to see other aircraft in flight, according to the AF, caused 46 per cent of their mid-air collisions.

Convair 880

Douglas DC-9

TO ANYONE who has been identified with the aviation industry for as long as three decades, and to anyone who is willing to admit our mistakes, it will seem at times as if our progress in heavier-than-air aviation had been less audacious than that of our European competitors, and that despite our initiative we were constantly held back by our consideration for regulations and for models which were already obsolete.

Right under our noses, today, are wrong trends, unrealized, and right trends, unappreciated, because we don't think things through. The turbo-jet engine, for example, could have been built and used thirty years ago. And why was it not? Because at that time we were thinking in terms of 100-miles-per-hour aircraft, and any designer would have known that the fuel consumption was prohibitive. None of us realized then that the jet engine immediately meant 600 miles per hour. And so we missed it.

Another thing that kept us from going ahead faster was the belief that engines and air frames are separate entities. A review of aircraft design clearly shows how much time and cost were consumed in trying to fit existing engines into air frames that were never designed for each other. The two are, after all, a unit, and—with the advent now of vertical flying—airflow requirements around a wing from the jet engine gas generator source

American Planes:

The Lessons of History

by

Grover Loening

Reprinted From The Atlantic

(One of the nation's foremost aircraft engineers, GROVER LOENING *has been building airplanes since 1911. He was general manager of the Wright Company, Dayton, Ohio, 1913-1914; inventor of the strut-braced monoplane and Loening amphibian airplane; and was awarded the Distinguished Service Award in 1919 for the Loening two-seater fighting plane. He received the Collier Trophy in 1922 and the Wright Brothers Memorial Trophy in 1952. Mr. Loening speaks with authority and experience in this striking comparison of aircraft development here and in Europe.)*

Boeing 707

make the wing construction an intimate part of the power plant.

Some clear and not too pleasant lessons are to be learned from a reflective perusal of the more than half century in which we have developed our air travel. One is how often designers and constructors have failed to finish up what was started. As a result of discouraging initial troubles and "bugs"—often intensified by lack of foresight and interest on the part of the aircraft customers, military, industrial, and civilian—the continuity of effort required to achieve success petered out, and consequently highly desirable developments that had been started were abandoned, only to be revived years later.

Many a novel and significant idea or suggestion has lain on our doorstep for years, unappreciated. Let us look at a few examples:

Wing Structure

In America, where flying was born, the biplane dominated our picture for almost twenty-five years, despite the obvious success of the monoplane in France and the fundamental correctness of its aerodynamics.

The Junkers low-wing, cantilever stressed-skin, all-metal monoplane, after its development in Germany in 1920, was brought over to this country and promptly ignored. It was not until William Stout developed the Ford planes many years later, that we moved seriously into the stressed-skin metal structure. Fokker, during the early twenties, also chose the cantilever stressed-skin, but used plywood covering (which could not take the weather).

Landing Gears

In earlier years, landing gears started with skids, to which wheels were added; but the skids were left on, only to become the cause of many wrecks when they broke on hard landings. From the very beginning, wheels alone were, obviously, the correct solution. In Europe, Bleriot, and in America, Curtiss were unique in realizing this, and the practical three-wheel gear was constantly being demonstrated as successful and correct by the early Curtiss planes. But practically no one else saw this. Even Curtiss gave it up later.

It should have been obvious that retractable landing gears were desirable at the earliest date at which we reached a speed of 100 miles per hour, 1912. But not until the advent of the successful amphibian plane (which *had* to have its landing gear foldable) did we learn that retracting a landing gear and housing it were neither too complicated nor too heavy. Nevertheless, it was some six or eight years before retractable gears came into more general use.

Engine Placement

On the early configurations in America, engines were to the side of, or behind, the aviator. The Wright design, translating twelve horsepower into effective enough thrust to fly eight hundred pounds, needed the two large geared-down propellers; in fact, this was one of the secrets of their success. But as more powerful engines came along, such as in the case of Curtiss' using his motorcycle engine, the gearing down was not needed, but the engines were kept behind the pilot. It is curious that we should have done this in the United States, when in France the great early pioneers, Bleriot and others, from the start had tractor-type monoplanes, although Farman and Voisin also used pushers.

It was not until 1913 that America saw the Burgess tractor with Renault motor, the Glen Martin Model T, and the Curtiss N, which later became the ubiquitous JN-4 (the Curtiss Jenny). As far as the general industry is concerned we waited four or five years before adopting the tractor-type airplane, which was to become practically universal as a land plane, even when later developed into multimotor models.

Enclosed Bodies

The advent of the fuselage with enclosed seating was stimulated, of course, by the use of the tractor engine. But it is remarkable to note that the obvious further streamlining and a closing in of the fuselage lagged for a few years. Nieuport, in his revolutionary little monoplane of 1910, which swept the field in competitive performance, practically started this vogue. But the enclosure of the aviators themselves in a cabin was very slow in coming, and it was not really until some ten or fifteen years later that the majority of the aviators, including the military, discovered that they need not have their heads out in the open air in order to fly and permitted their prejudices against closed cabins to give way to the comforts that were immediately evident.

High-lift Devices

Flaps and slots to slow down landing speeds, or rather to permit higher cruising speeds and heavier loads without too great a landing penalty, were a long time coming—much too long.

Handley-Page and Lachmann in Europe and Orville Wright in this country were researching these high-lift aids in the twenties. In fact, it is not generally known that Orville Wright in 1923 patented the split flap. By 1926, Handley-Page slots had been applied to the British Moth plane with great success. The first such Moth was imported to this country by me and flown widely in the East. Still, many airplanes were being built, developed, and accepted with no thought of high-lift devices. Others worked on this addition to wing structures, notably Harlan Fowler. Then, in 1929, the Guggenheim Competition was held, specifically designed to advance airplanes that could land in smaller fields over obstacles without sacrifice of useful high speed.

The winner of that competition was the Curtiss Tanager, a very intelligent design that made full use of the then existing high-lift devices. Did all aircraft, the year following, adopt split flaps, or Fowler flaps, or Handley-Page slots that had been so successfully demonstrated? They did not. There was the usual opposition, criticism, and delay for several years more before this highly desirable development in aircraft wing structure came to its now universal fruition.

Even recently we have had a rather surprising example of delay in acceptance: the Helio-Courier, developed in Boston by Koppen and Bollinger. A convincing demonstration of this STOL (steep-take-off and landing) airplane, with its correct use of slots and flaps for higher lift, was witnessed more than seven years ago, and despite the great need of our ground Army for a plane of this type, it is only recently that the Defense Department has become interested and ordered some.

Power Plants

The Wrights designed their own engine for their own aircraft, and for its purpose, it was correct. In France, in the earlier days, most of the early power plants were derived from automobile or motorcycle sources. The first plane to fly in Europe, the Santos-Dumont, used a thirty-horsepower two-cylinder Darracq motor. Before long —1909—the French developed the Gnome rotary air-cooled motor, which took over the field for several years in ever-increasing sizes and types and went into wide use in World War I.

In America we developed the Liberty motor, and in Germany also there was wide development of water-cooled autmobile types of upright engines. For an automobile this type of engine with crankshaft low was correct, but it was entirely wrong for aircraft.

From the beginning it was highly desirable for the crankshaft to be high, so as to provide propeller tip clearance, to keep the center of gravity low, and

to enable the pilot to see over the engine. But it was not until 1924 that we finally saw the light and inverted the dry-sump Liberty engine—in the configuration that it should have been in all along. Except for its successful use in the Loening amphibian, the change came almost too late, because the Liberty engine was shortly succeeded by the generally adopted radial air-cooled engine that developed from the pioneer work done by Charles Lawrance, the designer of Lindbergh's Wright Whirlwind engine.

Materials of Construction

Materials of construction of aircraft have gone through many cycles. For several years after World War I and in spite of the Zeppelin duralumin development, aluminum was suspect as a structural material. The famous specification 100-A of the Navy prohibited the use of aluminum in any structural part of aircraft. This is a pertinent example of how too rigid specifications, based on what was good practice in previous years, can prevent future development.

Today we face a similar situation in prohibitions against Fiberglas or plastic stressed structures because it is so difficult, theoretically, to calculate and check the stressed condition. Yet plastics may well have as great a future in aircraft structures as dural stressed-skin *monocoques* and wing panels had thirty years ago. We hardly need to recapitulate how metal took over from wood and replaced a material that just could not stand the weathering difficulties of day-in, day-out air operation compared to aluminum alloy, so long-lasting and reliable. New alloys—titanium and others—are also beckoning alluringly, like Fiberglas, for a chance to show their worth. Also "sandwich" materials are most promising. Will we still be slow to pick up the ball?

The lesson one seems to gather from these and many other instances of long delays in acceptance is the unpleasant one that aviators' likes and dislikes were given too much weight, and hence discouraged the engineers from perfecting their developments. In retrospect, one finds that worthy developments were ignored or abandoned because they were politically unwise. Many a wing flutter that scared a test pilot condemned to utter oblivion an airplane that had structural or configuration features of great importance and advantage. Had the customer and the builder been patient or wise enough to work out such "bugs," success would have followed more quickly.

On the other side of the picture, many an airplane with little commercial or military value was used for years because the upholstery and the windshield were well worked out or because a lucky combination of slip stream and wing flow (totally unforeseen by the designer) gave unusually good control on landing, which pleased the pilot. Another personal prejudice revolved around ease of egress in case of accident.

As the years went on and there was a more scientific appraisal of new aircraft through test flying, other drags on development occurred, causing unnecessary time lags from the day of inception to the hardware-in-use stage. These delays were largely bureaucratic.

In 1926, the original Civil Aeronautics Act, reinforced by the later enactment of 1938, put the government into the position of passing judgment on the aircraft that the aviation industry wished to sell to the public and issuing certificates of air-worthiness. We accepted this supervision unthinkingly, largely because of the supposed great risk that a gullible public would be subjected to by having offered to it all kinds of aircraft that would fall apart in the air.

And then the bureaucracy really got to work. The inspection and engineering staffs of the Civil Aeronautics organizations of the government had to grow with each page of more and more detailed specification that the law called for. But here is the fallacy: by necessity, such specifications must specify last year's aircraft, because the writers of the specifications are not inventors or developers. Here is an example.

After World War II, in 1946, Robert Fulton designed and built in Connecticut an interesting new aircraft called the Airphibian, in which the body contained the engine. It was a perfectly operable small car from which the wings could be detached. Fulton never complained, but went through the Civil Aeronautics certification procedure. He was an expert designed and skillful builder. He would have had an immediate market from 1947 to 1950, but it was not until 1952 that he had managed finally to complete the Civil Aeronautics procedure. By the time he got his certificate, other developments in aviation had caused him to lose his market. The procedure had brought about practically no changes in the aircraft, but had changed many pages of Civil Aeronautics rules by waivers and allowances. Not all cases of CAA certification have been so bad as this, and recently there is much improvement—not in the law, but in the more liberal way the CAA and the FAA are interpreting their mandate.

Let us compare this experience with that of the automobile industry. The automobile in the hands of the public is fully as dangerous as aircraft, and yet there is no Washington government bureaucracy that requires each new model to have a "certificate of road-worthiness." To be sure, in the last fifty or sixty years, many automobiles have been discarded; some of them were badly built and dangerous, but the consumer quickly found this out, and the death blow to the company's product was so strongly disciplinary that the companies which survived did so only by the most careful designing and the most exacting test procedures of their own, before the public could even get a look at their product. The states do a simple job of checking every car for safe conditions, but no design certification is thought of.

This is as it should be, and here is a lesson from the past that we could apply almost at once to small aircraft for use as private vehicles. Of course, huge air transports carrying more than a hundred passengers are comparable to ships, and some government inspection and certification may be needed. In this certification and inspection area, should not the insurance companies take a much greater role—as Lloyd's does in shipping? Let us think hard about any system that will get us away from the cumbersome governmental one our laws now call for.

Another bureaucratic drag on progress is in the system involved in what the Air Force calls "the Requirements Division." Here we are supposed to have the official requirements for new aircraft. For purely military requirements, such as the need to carry a larger gun or a different kind of bomb, this is fully justified. But it has unconsciously been extended by the Pentagon bureaucracy to cover too many broad features and types of aircraft. It is perfectly safe to say that, had the Junkers design been presented to a requirements division in 1920, the answer would have been: "We have no requirement for a low-wing stressed-skin all-metal aircraft."

Had an inventor appeared at the Requirements Division of the Air Force as recently as 1953 with an effective way to muffle the noise of aircraft power plants without sacrifice of performance the bureaucratic system

would have informed him: "There is no requirement for such a development." Intelligent and progressive officers sometimes alter these procedures on their own, and a new requirement is, in rare instances, created.

Russia seems to move more quickly in reaching the hardware-in-use stage after early inception. As nearly as we can ascertain, the Russians do not use our system. This situation we had better study. Instead of a Requirements Division, perhaps we had better have a Stimulation Division.

We are at a disadvantage, however, operating in our private enterprise system, because the expenditures of government have to be substantiated, audited, and interminably reviewed, even to this day's unwarrantedly punitive renegotiation nonsense.

Let us now look at today's aircraft operation for some further lessons and possibly to anticipate some future troubles.

Today all aircraft can be spun and recovered with safety; forty years ago, this was not the case. As a matter of fact, up to 1913, the "spinning nose dive" or the deadly "spiral dive from air pockets" was the disheartening cause of accident after accident. At Dayton, in 1913, we witnessed a vital moment in airplane operation. This was when Orville Wright, so discouraged by the accidents that were happening to his exhibition fliers and to a whole series of Army fliers (Hazelhurst, Love, Kelly, and others), was determined to test out what was happening.

Before long he himself came back from a test flight smiling instead of grim, because he had discovered what a "spin" is and how to get out of it: namely, by pushing forward on the controls; and why so many aviators had been killed: namely, by pulling back on the controls at the wrong time.

Now, forty-six years later, when we fly through the sound barrier, we discover a brief moment when controls are reversed. And today also we are somewhat plagued by "pitch-up" in the control of supersonic aircraft. Recently a jet airliner suddenly dived 29,000 feet. Are these manifestations of some new operational characteristic of swept-wing aircraft which may require controls other than those we have provided?

The operation of aircraft has become very complex, because of the constant addition of instruments. We have gone a long way from our first instruments —the string for sideslip, wire whistling for speed, and the railroad track for navigation! Are our present instruments the ones we should have? Has not the barometric altimeter caused us so many accidents that we should long ago have gone to something better? Our automatic pilots are all based on known flying procedures. What if the new types required some new control of flying procedure, or crossed controls to prevent pitch-up or the swept-wing dive? It is exactly in such areas that we are much too complacent and ignore problems that should alert us more quickly to the utmost inquiry.

Location of the engines — an answer to noise problem?

In 1917, Lawrence Sperry invented and demonstrated the turn-and-bank indicator. In 1934, the Army took on the airmail. Its planes did not have the turn and bank indicator as did the civilian planes. This one regrettable oversight was so serious in causing accidents that the cancellation of the Army's effort followed.

Noise abatement is now one of our most irritating problems, but we should know by now that abatement is not the answer to noise. The answer is to design a power plant with as much a fundamental limit on noise, in its original design, as there is today on its fuel consumption and weight. We can soundproof against internal noise rather well in a cabin, but external noise has made the airplane an undesirable neighbor, to the point that it has been ruled out in many places.

Airports

Literally billions of dollars are being spent on airports around the world. In too many instances, particularly in America, these are one-runway airports —in other words, one-track railroads. It is difficult to understand why this is so, when we stop to remember that whole squadrons of aircraft during the war (and even now) landed on reasonably wide runways within a few feet of each other at the same time, and similarly took off in formation. Why should not an airport have at least three runways in each direction, spaced possible 300-feet on centers? It could then land aircraft three at the same time.

The hesitation on this is typical of our complacent thoughtlessness. There is no danger involved. Thousands of times a day the pilots of large transports land their planes accurately and within a few feet of the center line of runways.

Radio, of course, has helped tremendously to bring about the era of practical civilian flying, and it still can be counted on to give us the things we need: simple collision-avoiding, close-reading radar with one-mile radius, not two hundred miles; direct-reading radio altimeters; more and better lighting of airports and runways. And in regard to all these instruments and landing aids using electronics one must not overlook the fact that visual line-of-sight above the horizon does not work for a low-flying airplane or helicopter, flying behind hills or buildings.

The Jet Plane Development

Jet planes are not being developed in the same way in America as they are in Europe in one particularly prom-

inent characteristic: the location of the jet engine. The Douglas DC-8 and Convair 880 have followed the lead of the Boeing 707, which naturally followed the lead of the B-47 and the B-52. Unfortunately, these leads seem to derive from the old position of piston engines in nacelles mounted outboard on the wings. Here we have a typical illustration of a lesson not learned. For a jet engine this is clearly not a good location. Jet engines are very light, so that the structural saving of spreading the weight over the wing is much less than in the case of the piston engine. Also there is no propeller clearance requirement. But the engines are now located so low that they will ingest any loose material on the runway with great risk to the delicate turbine engine interiors.

The outboard engine is so low that a tire or wheel failure on one side would come near to breaking it up on the ground, followed possibly by fire from the gas tanks above it. The position of the engine under the wings makes the wing a perfect sounding board to disturb the neighbors below, and the inboard engine is so located that its noise cone hits the rear of the fuselage, the result being almost unbearable. The builders and operators are aware of these features and are doing all they still can to give us excellent safety.

But in Europe, most of the newer commercial designers completely separate themselves from all piston engine concepts by placing the jet engines where they belong: above the wing and to the rear, mounted to the fuselage and leaving the wing with perfect aerodynamic cleanness. Maintenance also is improved by this location. The vertical-take-off concepts mentioned below may soften the impact of this questionable American design. Let us hope they do.

The Lift Plane: VTOL

The biggest revolution in the coming design of useful aircraft will be in the advent of the direct-lift airplane, sometimes awkwardly called VTOL (vertical take-off and landing).

After ten years of intensive research, resulting in several bookshelves full of excellent laboratory reports on how to make a fast airplane land vertically, it is only this year that we are beginning to show progress in this development. Boundary layer control is only one facet of this. Tilting wings, tilting jet engines, and other ways are being developed.

The helicopter does not quite fill the bill, simply because its speed is limited on account of the rotor configuration. Even if helicopters get up to a high cruising speed of 200 miles per hour, they will still at that time have to compete with fixed-wing aircraft of over twice that speed.

Now, throughout the history of aircraft development there is one lesson that stands out clearly, and that is that high speed is always the successful characteristic of any type of operation, even on the shortest ranges. Slow aircraft, no matter for what purposes have never survived.

On the other hand, the airplane as we know it is a very deficient vehicle because it cannot slow down, hover, and back up, as every other vehicle can do. The penalty we pay for this characteristic—of having to keep going in order to keep up—is great. More skill is needed in operation. Prepared airports must be provided with preposterous runways of 10,000 and 15,000-foot length. As many as a hundred square miles of airspace must be reserved for each jet plane while it awaits its turn to land on the one-track-railway airport. All because jets cannot slow down below 180 miles per hour!

There are many objections to lift planes (VTOL) now being voiced. One is that the fuel consumption for vertical flying is utterly prohibitive. In the light of history, this belongs with the objections that were raised to monoplanes, to metal construction, and to slots and flaps.

A simple analysis will show quite quickly that while direct lift by jet will need three or four times the thrust of the existing jet engine configurations and will, therefore, use three times the fuel, the actual fuel used by the jet transport in taxiing out to the end of a long runway, waiting for clearance, making the long take-off run, then climbing to 1,000 feet is, if anything, more than the direct-lift plane would use rising immediately from its pad at the loading ramp with all engines full-out to 1,000 feet and then shutting off its lift engines.

Another argument in the same class as these old shibboleths concerns the additional weight involved in the extra jet engines for vertical thrust. Actually, Vertical-lift capability means a much lighter landing gear; in fact, it might almost revert fifty-seven years back to the Wright skids, to an aircraft with practically no landing wear at all (just little rollers to push around the ramp), so that the weight of the extra jet engines that are needed for the vertical operation could be compensated for and would represent no more of burden to the aircraft than did the landing gear itself. Originally, this represented 6 to 10 per cent of the empty weight of the aircraft, used only for a short while on landing and take-off and carried neatly folded in precious room in the body for thousands of miles in which it was utterly useless. Whereas the extra jet engines could, in a pinch, be used if the other power plants failed, or for quicker climb.

And with the ability to rise vertically and fly fast, the lift plane in smaller sizes (if not too noisy) would at last penetrate the open and fertile field of private vehicle aircraft—which has hardly even been touched, although we already lead the world in this field.

Immediately when we contemplate many different designs of aircraft for vertical lift and high speed, we find that the gas generator (the jet engine power plant) will most likely become an intimate part of the wing.

In 1926, Henry Ford visited an aircraft show in Detroit. As he was leaving, he turned and looked over the planes and said, with his usual finality and quickness: "Let me tell you, these things will never amount to anything until they use their power to land with." History will show that he was right.

The growth of air transport in the United States from nothing in 1920 to 24 billion passenger miles in 1958 is merely a beginning. We will shortly progress into supersonic flying, all over the world. Craft which will go to Europe in an hour and around the world in eight hours are on the drafting board. But there is much left to do to perfect our utilization of the air ocean in which we live. Tolerable noise, vibration, and acceleration must accompany supersonic flight. And greater safety!

We are becoming aware that speed is the *raison d'etre* of flying, particularly in air transportation of passengers. Have we learned that the greatest comfort of all to a passenger is the notice that he has arrived? A supercomfortable seat does not balance a tediously slow aircraft.

Also one last thought, almost in metaphysics. History seems to show that anything man can clearly imagine eventually materializes into reality. In our travels and in the movements of ourselves and our goods, we are about to obsolete the wheel, just as the wheel and axle invention obsoleted the skid, some ten thousand years ago.

Air Safety:

An International Question

Shown here are delegates to the ICAO Jet Operational Requirements Panel held in Montreal, Canada, Sept. 28—Oct. 5

(L.-R.) Dr. Goddard, FAA; Dr. McFarland, Harvard; Dr. Sayen, IFALPA and ALPA; and Jerry Lederer, FSF; Presented their views on safety at the Seminar.

Round-table discussions such as this were held throughout the ICAO Seminar.

Special Report:

ALPA Supplementary Brief Submitted to FAA on Pilot Age Limitation Question

In the brief of the Association submitted to the Administrator on September 25, 1959, in opposition to his proposals to establish a compulsory chronological retirement age for air line pilots, the Association contended that the Administrator and the individual air carriers have available to them adequate remedies of a precise and tested nature to determine the physical and technical competence of any pilot without the addition of the proposed rule. The purposes of this supplementary comment are threefold: First, to summarize these remedies, explain their superiority over the proposal of the Administrator and point out that their proper application makes the Administrator's proposal unnecessary and unfair. Second, to briefly review and analyze comments regarding these proposals which have been submitted by other interested parties. Third, to emphasize both the discriminating nature of these proposals and the fact that they do not really face one of the major problems they are trying to solve, i.e., that of the safety hazard associated with potential incapacitation of a pilot in flight.

Presently available methods for insuring the physical and technical competency of air line pilots are not only adequate but demonstrably superior to the Administrator's proposals.

Methods', Procedures Available to the Administrator

Under present rules and regulations, the following procedures are available to and utilized by the Administrator in determining the physical condition and technical proficiency of any pilot:

- The pilot is required to submit to physical examinations at least once every six months to determine whether he meets physical standards established by the Administrator.
- In the event that there is any question as to the physical condition of an individual pilot, the Administrator may require further examination of the particular problem.
- In the event there is any question as to the physical condition of a pilot, the Administrator may require more frequent physical examinations.
- In the event a pilot fails to meet any of the physical requirements prescribed by the Administrator and determined by his representatives, the Administrator is empowered to refuse to renew the pilot's medical certificate and, therefore, his right to utilize his pilot's license.
- Each pilot is required to demonstrate his ability to meet the proficiency standards prescribed by the Administrator to a representative of the Administrator at least once every six months.
- A pilot is required to submit to additional tests of his proficiency either under test conditions or by observing his actual performance on the job at any time desired by the Administrator or in the event any doubt as to the proficiency of a pilot arises at any time.
- The Administrator may prescribe such additional demonstrations of proficiency as he finds necessary.

Aviation Organizations, Individual Organizations, Citizens and Pilots Stand Firm Against Compulsory Chronological Retirement-Doctors Split

▸ The Administrator may remove any pilot from flight duty under Section 609 of the Federal Aviation Act at any time that he deems such action necessary in the interest of safety.

▸ The Administrator may initiate action to suspend or revoke the certificate of any pilot he decides is not competent to fulfill the requirements of his pilot's certificate.

Methods and Procedures Available to the Air Carriers

In determining the physical condition and proficiency of any pilot, an air carrier under existing law, regulations, and provisions of collective bargaining agreements:

▸ May remove any pilot from scheduled flying for the Company at any time management does not feel that he is physically fit or competent.

▸ May examine the proficiency, either by prescribed tests or enroute observation, of any pilot at any time.

▸ May require additional training for any pilot at any time.

▸ May require the pilot to submit to physical examinations to determine whether he meets the standards prescribed by the Administrator for his pilot's certificate.

▸ May, if the air carrier wishes to go beyond these procedures and impose a chronological retirement age for its pilots, utilize the method Congress has provided under the Railway Labor Act which permits all parameters of this complex problem to be considered. (Each of the preceding procedures has been utilized in the past if, in the opinion of the carrier involved, individual circumstances required it. However, no carrier has ever considered the establishment of a chronological retirement age for pilots of sufficient importance to utilize the procedures of the Railway Labor Act which are the only procedures available with sufficient latitude to consider all aspects of the probelm.)

It is obvious from the foregoing that both the Administrator and the management of air carriers have available adequate means of determining the physical condition and professional competency of any pilot at any time through the utilization of tested and accepted procedures historically and currently employed to make these determinations for all pilots regardless of chronological age. Both the Administrator and the management of air carriers are obligated and empowered under present law, rules and regulations, and the provisions of collective bargaining agreements to immediately remove any pilot from flight duty who does not meet these qualifications.

The assumption that chronological age is any measure of competency or physical condition, or that adoption of these proposals will add anything to foregoing measurements, is fallacious and not supported by evidence. In the absence of such evidence, the Administrator is not empowered to adopt the proposed rule.

If any air carrier management wishes to supplement existing provisions for the compulsory retirement of its pilots upon loss of either physical or technical proficiency with an additional provision for the retirement of its pilots at a specific chronological age, adequate means are available for this purpose. These presently available procedures are superior to the Administrator's proposals in that all parameters of this exceedingly complex problem can be considered and dealt with in a manner equitable to both parties.

Comments by Other "Interested Parties"

In order to facilitate analysis, the comments which have been submitted in response to these proposals have been divided into the following groups:

▸ Organizations primarily concerned with aviation, exclusive of Medical Organizations.

▸ Medical Organizations and individuals with medical background.

▸ Comments by individual air line pilots.

▸ Comments by other individuals active or interested in aviation.

(A tabulation is included at the end of this Report.)

Organizations Primarily Concerned With Aviation

In addition to the Air Line Pilots Association, comments were submitted by the Airline Dispatchers Association, The Aircraft Owners and Pilots Association, the National Business Aircraft Association, the National Aviation Trades Association, the Air Transport Association, and the Flight Engineers International Association. These proposals were aggressively opposed by all but the latter two organizations. Even these qualified their support, and conceded the arbitrary nature of the proposals.

The comment of the Air Transport Association is particularly interesting. The original deadline date for the submission of comments was extended at its request because in their words, "the proposals in these draft releases are considered by the air lines to have far reaching consequences and deal with matters of the deepest concern to the air lines." Finally, after recognizing the complexity of the subject and requesting an extension in order to thoroughly study the proposals, the ATA submitted a one and one-half page comment consisting of an introduction, a rejection of the age 55 turbo-jet transition cut-off, and two short paragraphs of generalities in support of the unqualified cut-off at chronological age 60. No evidence in support of their position was submitted.

Its comment in support of the 60 cut-off stated:

"The air lines recognize that any particular maximum age limit which FAA decides upon for the above purpose will necessarily be arbitrary. **There will be pilots in any given group who would be in sufficiently good condition that they could continue flying beyond the age limitation . . .**

(and)

". . . Further, for the first time in the history of the air line industry, there are in the employ of the air lines a considerable number of pilots who will soon be reaching retirement age and who **quite naturally and understandably wish to continue in their chosen profession. Thus, the problem is a growing one which deserves action even though such action may be somewhat arbitrary."** (Emphasis supplied.)

We believe this comment recognizes both the arbitrary nature of these proposals and the fact that they involve industrial relations and not individual licensing considerations. There is no suggestion that the procedures which enable air lines to retire physically or technically incompetent pilots from flying are no longer practical, or that these procedures dramatically lose their validity coincident with the pilot's 60th birthday. There is only concern over the "growing" industrial relations problem of retiring competent pilots which it could solve by means of a "somewhat arbitrary" governmental regulation. To permit the Federal Aviation Agency to be used for these purposes would amount to prostitution of its basic functions.

Medical Organizations and Individuals

The only aero-medical organization which had submitted comments by October 12, 1959 (two weeks after the extended deadline), was the Civil Aviation Medical Association, which organization consists of the medical examiners designated by the Civil Air Surgeon of the Federal Aviation Agency. Despite the fact that the brief comment contained in its submission seems restricted to turbine powered aircraft (it refers to high performance aircraft, 100 plus lives, and five million dollar aircraft), their final paragraph in-

dicates support for both proposals.

The CAMA comment disturbs us because that Association consists of the individuals upon whom pilots must depend for competent, impartial evaluation of their right to continue to practice their chosen profession. We had hoped for a more thorough and comprehensive analysis of a proposal just one of whose ramifications can reduce the career earnings potential of pilots from $140,000 to $200,000. We feel further that not only does our profession deserve better treatment in the form of a thorough and comprehensive analysis of proposals of this type but that the responsibilities of professional organizations to the general public require it. There are admittedly cases where it is desirable to err conservatively on the side of safety. However, it is indefensible, and the cause of air safety is not well served, if that philosophy is used to cover up sloppy, inadequate, and incomplete analysis.

The substance of the CAMA position seems contained in the following excerpt from a member's letter which is quoted in their comment: ". . . I would be the first to admit that psychologic age may occasionally differ from chronological age, but I just don't know how the difference can be determined objectively. I am afraid flight checks, proficiency checks, etc., are too subjective to be the final answer." (Emphasis supplied.)

Nowhere in the literature have we found support for as close a relationship between physiological and chronological age as is implied here, yet this is characterized as a particularly apt analysis of the problem. Much more typical have been comments such as the following: "There is no scientific rhyme or reason for selecting '65' as the magic number separating the productive from the nonproductive, the healthy from the unhealthy. We see certain degenerative signs as men progress in years, but we also see many men 65 and over in better mental and physical health than persons 10 to 20 years younger." (Louis Orr, M.D., President, American Medical Association, emphasis supplied.)

"When attention is paid to differences between averages of age groups, sight should not be lost of the individual scores which make up these averages. **All studies show that persons of any age vary greatly.** As a result, one will find that even though, in some regard, the averages of 20-year-olds and 70-year-olds may be quite different, nevertheless **many of the 70-year-old will earn the same scores as many of the 20-year-olds. Individual differences are much greater than age differences.**" (Wayne Dennis, Ph.D., emphasis supplied.)

The contrast with CAMA's contention that only in rare or "exceptional" cases is chronological age different than "psychologic" age is striking. It is particularly striking when one realizes its position is not consistent with concepts generally accepted in the literature. Additional examples of current thinking are given in the comments in opposition to these proposals previously submitted by this Association.

We are also concerned with the assertion questioning the validity of flight checks and proficiency checks. It seems inconceivable that an actual concrete demonstration of ability to do the job should be questioned on the basis of excess subjectivity. We have previously discussed this subject in our reply to these proposals. It is difficult to believe that it could be the position of this Association of FAA Medical Examiners that the calendar provides a better method of determining pilot ability than do actual demonstrations of proficiency or that such demonstrations suddenly and dramatically lose their significance at midnight on the day preceding the particular birthday involved. Surely before such assertions can be given credence, they must be supported by data giving the studies which led to this conclusion, including such details as number of proficiency checks observed, were flight simulator checks included, was a representative sample of various pilot age groups included, etc. To make such statements purely on the basis of unsupported supposition and conjecture seems blatantly irresponsible.

Finally we note that this is the only organized group in Aviation which supported the chronological age cut-off at 55 for transition to turbo-jet aircraft. This is an interesting contradiction of fact since the medical examiners concede the physical fitness of these pilots. The age 55 proposal is presumably based on training problems—an area in which the medical examiner has previously claimed no particular knowledge.

These comments may in part explain the opposition of many examiners to the position stated by their organization.

Individuals With Primarily Medical Backgrounds

When the comments of individuals with a medical background are considered, the wide variation of opinion within that group is immediately apparent. Also, apparent was a wide variation in apparent familiarity with both the content of the air line pilot's job and the current procedures affecting him. For example, one doctor who supported these proposals also advanced the thesis that a six-month checkup, such as "some of the commercial lines require," should be a mandatory CAA requirement for "all pilots of commercial stature over the age of 40." The facts, of course, are that the CAA (now FAA) has for many years required semi-annual physicals for all pilots of the category apparently being referred to, and that many airlines also require an additional annual (not semi-annual) physical examination, from their own or an approved outside medical department or facility. Other comments proposed that the cut-offs be as low as 45 years, suggesting reversion to the concept of an "intrepid and daring birdman with the physical condition and maturity of a young athlete." The sparsity of individual replies in addition to this variation in concept is much too great to be translated into anything resembling substantial individual medical opinion in support of these proposals.

Comments by Individual Air Line Pilots

The preponderance of individual air line pilot replies opposed the proposals. Particular weight should be given to the copilot replies in opposition to the draft releases for these individuals not only fly with the older pilots and therefore observe their performance first-hand, but have a short-term vested interest in their early retirement. It should not be necessary to comment regarding those few individuals who openly supported arbitrary governmental disqualification of senior pilots so that they could have their jobs.

Replies From Other Interested Individuals

Every reply in this category opposed promulgation of these regulations. This unanimity of opinion is impressive. In addition, these replies from individual citizens who are not directly concerned with these proposals also indicate their emphatic approval and awareness of the enlightened concept of aging which is the official policy of other federal agencies and which is in accordance with the obvious desires of the Congress.

▶ Discrimination Against the Air Line Pilot

The proposals advanced by the Administrator in the name of safety are obviously discriminatory against the air line pilot. For example, in the name of safety all pilots are required to pass periodic physical examinations deemed

adequate for the type of flying they are permitted to do, with the periodicity and comprehensiveness of the examinations varying according to the class of pilot certificate involved. There is considerably more irony than logic in a philosophy of air safety which advocates grounding, on the basis of chronological age alone, only those pilots required to pass the most stringent and frequent class of physical examinations, and the only pilots required to periodically demonstrate retention of technical proficiency after passing their initial examination. It is our fervent hope and implicit assumption that when regulations governing our professional careers are being considered more weight will be given to the proposal's logic than to its irony.

Irrelevancy of Data Submitted In Support of the Proposals

1. The Administrator's "case" for a mandatory age 60 retirement appears, from documentation available, to be based solely on the increased mortality and/or incapacitation factor of older pilots. We have commented upon one phase of this problem on pages 31-33 of our original submission. However, even after accepting the Administrator's apparent assumption that the only, or at least the major, kind of incapacitation which is currently a valid air safety problem is that associated with cardiac disease, it is apparent that the problem is not being squarely faced nor is it being significantly helped by these proposals.

For example, in Draft Release 59-4, 5, and 6 it is predicted that there will be 80 pilots who are age 60 or over in 1962. If these proposals are supported, it must follow that a significant contribution to air safety will be made if those 80 pilots are grounded. The male cardiac death for persons age 60 or over is 1.3 per hundred. Applying this death rate to the 80 pilots results in only one expected cardiac death from pilots 60 or over in 1962. However, further analysis reveals that there will be at least 1,800 pilots in the 45-49 age group. The cardiac death rate for this group is .3 per hundred which converted could be expected to yield 5 cardiac deaths.

Looking further into the future, it was also predicted in the Draft Releases that by 1967, unless something were done to prevent it, there would be 250 air line pilots age 60 or over. This number results in the statistical likelihood of 3 cardiac deaths. However, in that same year there will be over 3,600 pilots age 45 to 49 with a comparable probability of 11 deaths.

The significance of these figures can perhaps best be illustrated if the Administrator's apparent premises are accepted in their narrowest context. This means that the following factors must be deliberately ignored.

- All incapacitations of the type referred to in pages 31 to 33 and related sections of the appendix in our original submission. (Actually we believe this is the greatest source of pilot in-flight incapacitation on the scheduled air lines.)
- All cardiac deaths among pilots age 44 and younger.
- All cardiac deaths among pilots age 50 to 59.
- The years of regular "screening" through periodic company and FAA physicals to which pilots are subjected, resulting in the termination of most pilot careers before sudden incapacitation strikes.

Even with consideration of these four factors eliminated, we find that in 1962 the proposal would statistically eliminate only one cardiac death while completely ignoring the 5 which would be expected in the 45-49 age agroup. If the implementation of this proposal were postponed until 1967 the statistical elimination of 3 pilot deaths could be expected. This is slightly more than ½ of the number of probable cardiac deaths which can be expected in the 45-49 age group five years earlier and which, of course, are not given any more consideration by the proposal than are the 11 statistically probable comparable deaths in the 45-49 bracket in 1967.

Therefore, if one is only willing to accept the premise that the air safety significance of the in-flight death of a 49-year-old pilot is as serious as is the in-flight death of a 60-year-old pilot, support of this proposal on grounds of solving a pilot incapacitation problem becomes completely untenable. (The male cardiac death rate was used in this example because of current concern in this area, however, other rates or total death rates are equally applicable and show similar relationships.)

If these proposals, then, do little more than shadow-box with the problem of pilot incapacitation even when viewed in ridiculously narrow perspective, it is obvious that if all parameters of this subject are considered, their contribution would be, at best, infinitesimal. However, the Administrator's responsibilities in this area cannot be so characterized. His responsibility requires consideration of the total problem, and there is no rule, regulation, or other type of provision which contributes as much toward the solution of the problem of pilot in-flight incapacitation as does the provision of a fail-safe crew. In the event of in-flight incapacitation of **any** crew member, a fail-safe crew enables the remaining crew member to take over safely in either normal or emergency situations. These proposals do not approach that type of protection. They imply movement in the direction of greater air safety when there is barely

"...bureaucratic nonsense..."

The Association has received support in its stand against establishment of maximum age limitations for pilots by the FAA from within the industry and from individuals concerned with aviation. Support has also come forth from various governmental agencies. Reprinted here as an example, is a letter from Senator Clair Engle (D-Calif.) who is also an aviation enthusiast.

"I have had occasion to review Civil Air Regulations Draft Release Number 59-4 concerning maximum age regulations for pilots. The release impressed me immediately as an excellent example of bureaucratic nonsense.

"The medical data, if it can be so termed, on which these conclusions are based, demonstrates only one thing conclusively, and that is that 'scientific advances are expected to add continually to this knowledge' and further 'as indicated, presently available data do not permit any precise determination of the specific age at which continued activities as a pilot can be said conclusively to constitute a hazard to safety under normal or emergency conditions of flight.'

"There is no one more interested in the safety of air travel than I am. There is no organization which has evidenced more interest in the safety of air travel than the Air Line Pilots Association. When it can be demonstrated that an individual has deteriorated physically to the point at which he is no longer safe to act as a pilot, he should be grounded whether his age be 40, 50, 60, or 70. But, to assume, and I mean assume, that all individuals are unsafe in jet aircraft at the age of 55, and that all individuals are unsafe in propeller aircraft at the age of 60, is neither reasonable nor can it be supported by medical data. I do not feel that this action constitutes responsible administration of the Civil Air Regulations."

discernible motion. The cause of air safety deserves something better.

The overall content of replies submitted regarding the FAA proposals also merits comment. The case advanced in their support in the "Draft Releases" consisted primarily of unsupported assertions and gross generalities of questionable relevance. Nearly every reply submitted in their support admittedly accepted them at face value. These replies, therefore, can be given little consideration if the premises on which they are based are not valid. Comments in opposition quarrelled vigorously with the Administrator's basic assumptions, and this Association submitted a detailed analysis and refutation of their content. The Civil Aeronautics Board submitted the only other comment which contained additional evidence. This evidence not only did not support these proposals but indeed raised serious doubts as to their validity.

It is conceded that rule-making is not properly accomplished by an election progress. However, rule-making must then be supported by rational and reliable evidence. It is mandatory, therefore, that if the Administrator has any intention of proceeding any further with the FAA proposals, he establish an evidentiary proceeding in which any facts in connection with these proposals may be fully developed.

Summary

The only organized aviation group (non-medical) which supported the proposal to impose chronological age cut-offs on air line pilots was the Air Transport Association, which supported only one-half of the Administrator's proposal (the age 60 cut-off) and readily acknowledged its arbitrary nature. Individual members of ATA strongly opposed the proposal. In defense of its position, the ATA states, ". . . for the first time in the history of the airline industry there are in the employ of the airlines a considerable number of pilots (many of whom are admittedly competent) who will soon be reaching retirement age and who quite naturally and understandably wish to continue in their chosen profession." The compulsory retirement of competent pilots at age 60 is an industrial relations problem. It is no more a licensing problem than would be the compulsory retirement of competent pilots at age 45. The only valid licensing consideration is the disqualification of incompetent pilots whether they are 35, 45 or any other age. It has been so recognized since the beginning of commercial aviation in this country.

The only comment which was submitted by an organized medical association came from the Civil Aviation Medical Association, and we have already commented upon its submission. We were particularly impressed by the wide variation in comments from individual examiners. There can be no question that there is a substantial difference of opinion within that group.

The absence of comment from such groups as the Aerospace Medical Association, the Industrial Medicine Association, and the American Medical Association, is also of interest, for these organizations have strongly supported other proposals with medical aspects which recently have been advanced by the Administrator. The outspoken opposition of the President of the American Medical Association to compulsory retirement has been widely reported in the public press.

The Civil Aeronautics Board was the only party commenting upon these proposals which submitted additional evidence, and the evidence which was submitted by the Board does not support the proposal of the Administrator.

These proposals are obviously discriminatory against the air line pilot. Air safety and the welfare of the general public do not recognize such distinctions. The continually increasing density of all types of air traffic over heavily populated urban areas makes consideration of all types and classes of aircraft operation mandatory. While today there is no available evidence justifying adoption of these regulations, if such evidence is developed in the future, it would not justify promulgation of regulations applying to only one segment of the total pilot population.

The proposals of the Administrator do not realistically attack the air safety problem of potential pilot incapacitation. They demonstrate a serious lack of perspective and completely unrealistic treatment in evidencing major concern over a few cases of potential incapacitation in the older age group while at the same time a considerably greater number of potential incapacitations from younger age groups are disregarded. Regardless of the criteria used, each is an individual incapacitation case and should be of equal concern to the Administrator. Fundamental logic, therefore, dictates that age per se cannot be the prime consideration but rather that there should be regulatory recognition of the need for policies and procedures that will insure safety in flight when sudden incapacitation, regardless of its cause, strikes any member of the crew. A fully qualified "fail-safe" pilot crew provides such safeguard.

While it would be inconceivable to consider the promulgation of these proposed regulations without an evidentiary hearing on the issues, insufficient evidence has been submitted to justify initiating that procedure. On the basis of available evidence, the arguments which have been advanced, and the comments which have been submitted in response to them, these proposals should be rejected in their entirety.

Analysis of Comments to FAA

To further analyze the subject of maximum age for pilots, the Association requested and received the entire docket of correspondence, data, etc., from the FAA. Tabulation of this material into categories resulted in the following:

Classification	No. of Replies	For age 55	For age 60	Against age 55	Against age 60	Non-Specific
1. Aviation Organization Replies (*)	7	0	1	6	5	
2. Air Carrier Replies	4	0	1	3	2	1 (WAL)
3. Individual Doctor Replies (**)	10	11	11	8	8	
4. Medical Organization	1	1	1			
5. Individual Air Line Pilot Replies	38	5	7	33	31	
6. Replies from Individual Citizens Active or Interested in Aviation	23	0	0	23	23	

(*) a. See ATA letter of September 28.
b. FEIA comment not tabulated account of inconclusive response.

(**) The responses of four doctors advocating limits considerably lower than those proposed have not been included because they were obviously based on a different frame of reference regarding an air line pilot's job.

Pilot Flies For A Living---Soars For Pleasure

If you've ever wondered about Soaring, here's a chance to get some first hand information. Just ride along compliments of . . .

C. F. Henderson, UAL

"STAY out here about this distance from the ridge, keep your speed at 55 to 60 mph and relax, we should be able to maintain a steady rate of climb to at least 3000 ft."

This was Don Lawrence, expert sailplaner, talking as he gave me the controls of our Sailplane after we had been aero-towed to 800 ft. along the ridge which runs up and down the valley at Wurtsboro, N.Y.

"Green Air"

Somewhat apprehensively I [illegible] to try and stay in this rising [illegible] which he had explained [illegible] due to the 10 to 15 mph wind from the NW striking the ridge and being diverted upward. The rate of climb indicator showed a steady 400 to 500 fpm ascent and the altimeter crept steadily upward past 2000 ft. Noting the airport receding behind the left wing, I turned to the left to return to within what I thought was safe gliding distance of the airport. This resulted in leaving the "green air" and my worried glance at the 300 fpm rate of descent made Don chuckle.

"Just continue your turn back around to the original heading", he instructed, "and you'll get back into the ridge lift again—then let me do the worrying about the distance from the field."

The lift came back and this time I stayed in it. We reached 3200 ft. where the lift steadied down to just enough to compensate for the 150 fpm sinking rate. We continued NEwd up the valley to Ellenville, N.Y., 12 miles from the airport we had left, but which to me seemed to be at least ten times that distance.

Don pointed out various sites on the ridge below where in the thirties he and other gliding enthusiasts had launched their "home-builts" for the two to three minute flight to the grass fields in the valley below. "This", he explained, "was the 'valley slide' and the very ultimate in those early days of gliding". "Sometimes we could make as many as three 90 degree turns before landing, derigging and hauling the primary glider up the mountainside for another 'slide'."

As he talked of their early escapades I began to relax with the realization that the soaring we were now doing was a far cry from those early experiments and adventures. The *sailplane* in which we were riding (glider is almost a nasty word these days) was built for the Naval Air Force training program during the late war and was designed to a stress of 14 g's! The instrument panel before us was more complete than [illegible] light planes as far as flight [illegible] were concerned, but [illegible] comforting lack of [illegible] instruments. One of those ships had been towed to a height of 44[illegible] well known Bishop [illegible] in California, and [illegible] used extensively for [illegible] other meteorological [illegible]

[illegible] from my reverie by [illegible]—"Let's work back to the airport and see if you can get this ship down." Feeling much more confident by now, I turned back to the SW and let the nose down slightly to convert some of our lift and altitude into speed. Don explained that we would make a normal entry into the pattern at Wurtsboro just as in a power plane, and that a slightly high turn from base leg to final was the only concession. This I did, and when it was evident that we would land well within the field, he demonstrated the use of spoilers. When these were extended fully from the wings it seemed like we were gliding in the proverbial red shack, for at the same speed of 60 mph that we had approached at, our sinking rate had been more than tripled. My reaction to this was to immediately close the spoilers which was very much like adding throttle to a power plane. Finally settling for one-half spoiler I managed to get down, although I nearly forgot that this was not a DC-7 and levelled off about 20 ft. in the air. Don explained that landing a sailplane was a matter of skimming on rather than levelling off and settling in as in a power plane.

The First Solo

My next landings were somewhat closer to the ground and Don commented—"how would you like to try a present day, high performance sailplane?" I replied that if there was anything more thrilling and higher performing than this one we had been flying, I had to be shown. We went over to the flight line where he pointed out a beautiful, metal construction, mid-winged sailplane. I noticed that it was a single place ship and asked how I was to check out in it. "Take it and go get some real soaring under your belt" said Don, and before I realized it, I was

Captain Monroe D. Hughes, UAL, pins the wings of a stewardess on his daughter, Carol, at recent graduation ceremonies at Cheyenne, Wyo.

off on tow.

Managing to release in the lift area along the ridge, I realized what was undoubtedly the thrill of my flying career.

After what seemed like only minutes but showed as one hour and twenty on my watch I "fought" my way out of the lift and down for the landing. Upon landing, I discovered that I had earned a "C" award for remaining aloft above the altitude of release for more than five minutes. This is the primary badge in soaring and is awarded by the Soaring Society of America, acting as the official representative of the Federation Aeronautique Internationale, for all accomplishments in the soaring field of international aviation.

Silver, Gold and Diamonds

These various international badges run from the primary "C" through "Silver C", "Gold C" to "Gold C with 3 Diamonds". This latter requires a distance flight of at least 187 miles to a specified goal, a free distance flight of 310 miles and an alittude gain of at least 16,404 ft. There are less than ninety of these in the world and only thirteen are held in the U.S. Here is an area where the Air line Pilots should be able to change some figures. The world distance record is 535 miles and most soaring pilots agree that this can be easily broken with proper planning and study by an experienced pilot.

I had to have one of these "gallant eagles" for my own. Before I had 5 hrs. of solo I had picked up a new kit and started building a Sailplane for myself. The kit is of all-metal construction with some fabric covering on fuselage and tail, stressed to 10 G's upright and 6 G's inverted and is almost as much fun to build as to fly. It is the most complete and satisfying project imaginable and takes no special tools except a rivet gun and a compressor. Mine has since carried me on several distance and altitude flights, and recently brought me a second place standing in a soaring meet at Elmira.

A Family Sport

A number of the Airline Pilots in this area have tried this superlative sport and all are as enthusiastic as I. If you are looking for a safe, thrilling, satisfying sport in which the whole family shares, with kids running wingtips and polishing canopies and the wives keeping records, swapping talk and urging hubby on while following for miles across country with car and trailer to pick him up, tired but happy, with one or two of his "diamonds" accomplished.Then try soaring, the *King of Sports.*

Airline Captain Doubles As Preacher

On weekdays Frank Swaim captains an airliner. On Sundays he preaches from the pulpit of the Church of Christ in Denver where he is an ordained minister. In his spare time, he and his wife, at his expense, offer a non-sectarian Bible correspondence course, teaching 208 students, 8 to 87 years of age, across the country.

"I'm just an ordinary married man with a wonderful wife and two boys and a keen desire to encourage the study of God's word," he said. "I feel that many of our social problems could be eliminated or at least minimized if all men knew more of the Bible." Born to a poor railroad worker in a remote Wyoming village and on his own from the age of 12, he credits faith for his full life.

Mel Swanson Flys West

Captain M. E. (Mel) Swanson, retired NWA Captain and former ALPA Region III Vice-President, died November 8 at the age of 59 after a long illness.

Born at the turn of the Century at Columbus, Ohio, August 17, 1900, he did his first flying at Norton Field in the city of his birth in 1925. He has been a member of ALPA since 1941.

Like most early-day pilots, he weathered the uncertain days of a young industry the hard way. He was Instructor and Operations Manager of flying schools in Wisconsin and Florida in 1929-30. He barnstormed Ford Tri-motors for eight years, covering all but eight states with air shows and circuses. He was a racing pilot. He participated in the National Air Races in Chicago in 1930, as well as many others throughout the country.

Capt. Swanson's air line career began in 1937 when he joined NWA as company test pilot. He has been flying for them every since.

During World War II he had supervision of flying for NWA Air Transport Command contract on the CANOL project near the Arctic circle the latter part of 1942 and early 1943. He also flew the Canadian and Alaskan Theater on the Aleutian Chain for ATC.

In November of 1952, the convention established the Executive Committee. He was the first pilot Vice-President to be elected to represent Region II. He served in this capacity from Jan. 1, 1953 to July 1, 1954.

He was a member of the orginal Board of Directors of the Mutual Aid Association, holding that position from June of 1953 to October of 1956.

His ALPA history shows he was active as officer and Air Safety Chairman for Local Executive Council No. 1 for several years. He represented pilots on NWA's system and in Washington in the Martin 202 controversy. He also represented NWA pilots and stockholders

M. E. SWANSON

in Wall Street during NWA and Capital Airline's proposed merger. He was extremely active in ALPA's reorganization. Swanson was a member of the 1952 and '53 Agreement Negotiating Committees.

He was a member of the Minneapolis Hangar QB's.

The passing of Mel Swanson brings sadness not only to his family, but also to his friends in the pilot group. His memory will be long remembered and his life can be best summed up in the words of President Sayen on the date of Mel's retirement in June of this year: ". . . Veterans such as yourself have made a great contribution to this business. Your personal sacrifices and many contributions in Association leadership have earned for you the respect of pilots everywhere. . . ."

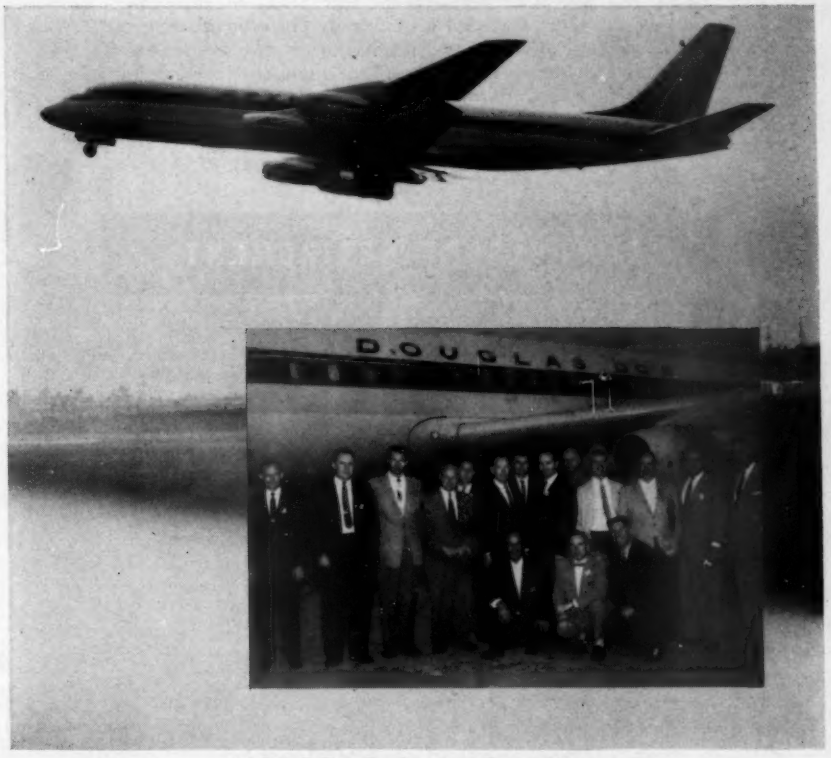
Progress Report On The Proposed FAA Rule Changes

The FAA is now in the process of consideration of many broad proposals aimed at proposed changes or additions to existing Civil Air Regulations. The extent of these proposed rules encompasses the majority of interested industry facets, all of which have taken definite stands either in support of or opposition to the proposals of the Federal Agency. Following is a report on the progress and status of the proposed changes along with the reaction of interested parties.

▸ **Draft releases 59-4, 59-5, and 59-6** which would require all pilots to retire at age of 60 and prohibit pilots age 55 or over from checking out on jets. The **ALPA's** position is that the proposal should be rejected in its entirety: **Reason:** No evidence for need of such a proposal, that there was neither medical evidence in support nor legal authority vested in the Administrator to impose such a rule. The **ADA, AOPA, NBAA,** and the **NATA** are aggressively opposed to the proposed rule. The **FEIA** and the **ATA** have conceded the arbitrary nature of the proposals, qualifying their support. The final paragraph in the comments of the Civil Aviation Medical Association, indicates suport for both proposals. **Individuals** with **medical** background, showed a high degree of variation of opinion.

▸ **Draft Release 59-3,** which would require copilots to hold type ratings on aircraft on which they are flying as copilot and be given a six month proficiency check and would also require air carriers to submit their training programs to FAA approval. Following an expected pattern, the major parties involved are diametrically opposed. Seven Supplemental Carriers, the **Air Transport Association** and the **ALTA,** representing the Local Service airlines, are in total opposition to the proposal. **Reason:** "Not economically practical and technically most difficult." The **ALPA** supports the proposal, backing its adoption with the additional provisions to create an Air Line Transport Copilot License and make training requirements enforceable.

▸ **Draft Release 59-10,** which would make airborne radar mandatory on large four-engine passenger-carrying aircraft. The **ALPA** supports the proposal and in addition says radar should be mandatory on all scheduled aircraft both passenger and cargo, two-engine as well as four-engine. The **ATA** argues that the FAA and ALPA proposals are impractical and unnecessary. **Reason: Cost; an unneccesarily** extensive modification of the planes.



ALPA DC-8 Evaluation Committee.

ALPA Committee Compiling Phase II Report

The ALPA DC-8 Evaluation Committee is compiling its report on Phase II portion of the evaluation of Douglas' new DC-8 Jet Aircraft. Generally, the report indicates that the committee was well satisfied with the flight handling characteristics of the aircraft.

The picture above shows the test airplane used in the evaluation during a three engine climbout with the number one engine made inoperative at V-1 speed. The committee reported the DC-8 successfully reached an altitude of over 40 feet on the three engines, with a take-off weight of the aircraft at 260,000 lbs. gross weight.

In addition, to the performance demonstrations, the committee performed various demonstrations of stall configurations, wing spoilers, normal landings and landings under several emergency conditions, and in-flight reversing techniques.

Association Representatives at the DC-8 flight tests as pictured above were: (L-R) R. D. Potter (DAL), J. Meek (DAL), W. Smith, DACO Test Pilot; M. Olson, DACO Sr. Project Engr.; E. R. Watson (EAL), G. Sperry (UAL committee chairman), J. Dunn, DACO Staff Aerodynamist; T. C. Patecell (PAA), M. B. Cahill (NWA), E. F. Taaffee (NAL), W. Sindo (PNG), T. P. Linnert, ALPA Engr.; W. Dickinson, DACO Assistant Chief Engr.; (Kneeling L-R) J. Martin, DACO Test Pilot; R. A. Stone (UAL), E. J. Bechtold (EAL).

As Others See It

Excerpts from Comments in The News of Interest to Pilots

Air line pilots, the Association, its activities and its programs have been receiving prominent public recognition recently in the nation's press as well as on the air waves of radio and television. The result has been an increasing understanding of the air line pilots as professional men, a clearer picture of the type of organization which represents them, and a greater awareness of the manner in which the Association is cooperating in reaching solutions to problems which benefit the nation, the industry, and the public. On this page are a few of the hundreds of clippings of this nature which cross the editor's desk each month.

COMPULSORY RETIREMENT

Age Isn't What Counts

THE AIR LINE Pilots Association, an AFL-CIO union, has less than a month to head off a plan for compulsory retirement of air line pilots at the age of 60, and is fighting hard to do it. In a new series of statements issued this week, the pilot's group declared that the idea has no precedent, no medical evidence for its need, and no legal authority to back it up.

The plan was announced three months ago by Elwood R. Quesada, administrator of the federal aviation authority. Under it, all air line pilots would be retired at the age of 60 and would be barred from flying jet planes at age of 55.

A decision was scheduled for Oct. 1, but the proposal kicked up such a storm that it was postponed for 30 days.

★

IN OUR VIEW, the plan shares all the faults of all such compulsory retirement ideas; it substitutes a rigid, arbitrary rule for knowledge and judgment.

As the union president, Clarence N. Sayen, pointed out, there is no evidence that a pilot's age affects his performance. Of the 27 air line accidents since 1946 which were attributed to the commanding pilot, the oldest pilot involved was 50. One was in his twenties, 16 were in their thirties, and nine in their forties.

This may prove only that most air line pilots are in their thirties, but it is a strong indication that pilots 50 and older are at least as capable as their juniors and quite possibly more so.

★

CERTAINLY no pilot should be permitted to fly passengers without passing rigorous physical tests, including eyesight, hearing, speed of reflexes, and so on. But such tests are all that is needed.

As we pointed out in this column yesterday, the policy of retiring capable men at an arbitrary age just because the book says so is unjust and shortsighted. It hurts the men and short-changes their employer of years of valuable, experienced service.

One of the smartest flyers we ever knew used to say he didn't want to be the most brilliant pilot, just the oldest.

JET AGE PROBLEMS

Longer Runways Urged by Pilots

From the Herald Tribune Bureau

CHICAGO, Oct. 13 — Airport runways too short for the jet age were a major topic of complaint today at the opening of the seventh annual Air Safety Forum of the Air Line Pilots' Association.

The failure of the air-line industry to agree on "adequate standards" of runway lengths, declared Theodore C. Linnert, head of A. L. P. A. engineering and air safety, "almost seems deliberate in view of the amount of military experience available and the many papers which were presented by industry and A. L. P. A. representatives pleading for 12,000-foot runways with overrun areas as early as 1954."

Mr. Linnert recalled that 12,000-foot runways were "regarded as ridiculous in some quarters," but he noted that Chicago's O'Hare Field will soon have an 11,600-foot runway and commented: "Chicago can be proud of leading the nation in providing this highly needed airport safety factor for the protection of the air-traveling public.

The air-line industry, he told the 250 air safety experts attending the three-day forum, also has put economy ahead of passenger safety in determining runway lengths in terms of allowing sufficient altitude in case of engine failure on take-off.

NATIONAL DEFENSE

Sensible and Patriotic Unionism

Agreements just made by three aviation unions with an airline show how sane labor leadership can contribute to the safety and strength of the country.

The Air Line Pilots Assn., the Flight Engineers International and the Air Lines Dispatchers' Assns. have contracted with Pan American World Airways that cargo and personnel vital to national defense will be moved, under government control, despite any future labor dispute in which the three unions might become involved. We are told by Pan American that these agreements are the first of their kind in the history of transportation. We hope they are not the last. Such commitments would go far to offset the bad impressions created by the activities of unioneers like James R. Hoffa, Teamster president.

Even more important, they would constitute significant notice to Moscow that, where our national defense is concerned, there is no conflict of interest between workers and employers.

UNWANTED PASSENGERS

Airline Pilots Demand No Criminal Passengers

WASHINGTON (UPI) —The nation's airline pilots have told the federal government they don't want to carry dangerous criminals on commercial planes.

The Air Line Pilots Association (ALPA), in a letter to the Federal Aviation Agency, asked for and was granted an early conference on the problem.

ALPA reminded the FAA that nearly two years ago a special union committee strongly urged that "the practice of transporting convicted criminals and indicted individuals under guard on commercial airlines be entirely prohibited.

The committee, which spent more than a year studying the entire field of air cargo as it related to safety, said transporting criminals by air represented a great potential hazard to other passengers.

Lists Dangers

Its report cited these points:

—The airlines frequently are not even advised that dangerous criminals will be aboard certain flights.

—Seldom is an airline captain told in advance that a criminal is being transported under guard on his flight. Usually, the first the captain hears of it is when the hostess informs him a passenger is handcuffed to a person sitting next to him.

—Desperate criminals may take desperate measures to escape and in a plane flying thousands of feet high such men could endanger many lives by trying to commandeer the aircraft at the point of a gun.

—Enforcement officers prefer to transport maximum security prisoners by air in the belief that escape is less likely. But this is exactly the type of prisoner who would resort to such apparently far-fetched schemes as forcing the crew to land at an isolated field. There also is the danger of a stray bullet from a gun battle in a plane puncturing a window and causing explosive decompression in a pressurized cabin.

Asks FBI Advice

The ALPA letter called the FAA's attention to a recent incident in which a large airline refused to carry Larry Lord Motherwell under guard from Atlanta to California where he faced charges of murdering a well-to-do widow. Another airline finally flew Motherwell to California.

The committee's final report said that if no new safeguards were developed, the only alternative would be a federal regulation requiring all dangerous criminals be carried on private chartered flights.

AIRBORNE LIQUOR

Pilots Protest Liquor Aloft

The Airline Pilots Association, the powerful pilots' union, makes a strong argument for national legislation prohibiting the airlines from serving hard liquor to passengers on their aircraft.

The union's members are charged by law, custom, and practical necessity with responsibility for the safety of the aircraft they fly and the passengers in their charge, just as sea captains assume full responsibility for their ships, with authority to regulate the conduct of crewmen and passengers in situations involving safety. Drinking on the scheduled airliners sometimes interferes with the safety, comfort, and convenience of many passengers, so that, in the interests of the majority, it should be barred and not left to the discretion of individual pilots.

The scheduled airlines find many persons, including their passengers, consider a wee nip at or before meals both stimulating and relaxing. Liquor is served in the best private clubs, in railroad diners or steamship dining rooms. So why not aboard airlines?

The rub is that alcohol, at the higher altitudes, is even more stimulating than at the levels used by steamers or railroad trains. Travelers on the airliners are thrown into closer contact with each other than in other modes of transportation and the actions of one inebriated passenger might more readily endanger all than in surface transportation.

The record of emergencies and inconveniences aloft—such as forced landings, distraction of pilots in attending to obstreperous passengers when their services are urgently needed in the cockpit—is a long one that can't readily be ignored. The men charged with responsibilities for handling these emergencies deserve a full hearing.

AIRPORT NOISE PROBLEM

Airline Pilots Say They Help Cut Noise

Chicago (UPI)—The Air Line Pilots Association said yesterday that its members were making "every reasonable and conscientious effort consistent with safety to reduce aircraft noise in densely populated areas near airports."

C. N. Sayen, ALPA president, said recent allegations of the New York Port Authority, operators of major New York-New Jersey civil air terminals, were "grossly inaccurate and misleading." These allegations, he said, implied lack of cooperation in abating airport noise and "did not present the true picture of the entire problem to the public. The air line pilots have been aware of the noise problem for year and realize it is irritating to close-to-airport residents, many of whom are pilots themselves, and have followed positive programs of noise abatement since 1947."

The ALPA executive said airline pilots were cooperating fully in programs to reduce the noise nuisance in any manner "consistent with safe operations," not only in New York, but nationally and internationally as well.

Referring specifically to the New York problem, Sayen said every takeoff and landing has been monitored since 1952, and the record would show that the pilots had exercised every possible degree of consideration. An objective analysis of the record, he said, also would show that the noise problem was complicated during the past summer by airport construction and other factors which necessitated the use of certain traffic procedures that aggravated the problem.

INDUSTRY PROBLEMS

Calls Air Transport 'Ceiling' Unlimited

Special to World-Telegram and Sun.

CHICAGO, Aug. 11—The ceiling on the potential of commercial air transportation is virtually unlimited, according to C. N. Sayen, president, Air Line Pilots Assn., Inc., in an article in the Air Line Pilot. He predicts an optimistic outlook for the future of the industry once some of its more critical problems have been solved.

Mr. Sayen points out that labor relations are not one of the major problems although disproportionate publicity given to them in the past year have given that appearance.

Labor relations in the industry are good, Mr. Sayen said. The industry's problems largely fall in the categories of governmental, managerial, economic and safety, he indicated. He recommended as a solution programs to attract new users of air transportation; development of air cargo and helicopter fields, and provision of operational facilities to permit aircraft to realize full capabilities.

(Continued from Page 21)

ceed 50 miles. In view of what has been said initially about the extent of hurricane-force winds, this means that the warning area should normally be substantially larger than the area actually sustaining damage.

Because of the time needed for meteorological services to process data and make predictions, the forecaster must look 30-36 hours ahead in order to provide one-day forecasts for the public. On this time scale an accuracy of center prediction within 50 miles is only rarely achieved at present. Hurricanes on the average move at a rate of 12-15 mph in the tropics, but the rate of motion often increases to twice this amount, at times even reaches 50-60 mph, when storms come out of the tropics and impinge on the northeastern United States. Even at a speed of 15 mph, the error in placing a center 36 hours ahead will exceed 50 miles, if the predicted course of the storm is off by as little as 10° on the 360° compass. At higher rates of motion, the error will be correspondingly larger. These brief calculations show that a very high degree of forecast accuracy is needed for predictions useful for the public.

Determining Storm Displacement

The factors determining storm displacement, and especially changes of path, reside inside the hurricane only to a minor extent. Although considerable proficiency has been achieved in tracking centers and observing their interior with airplane and radar, this information helps very little for warnings except on a very short time scale of a few hours. The longer a forecast is desired, the farther away from the storm area must one look for the controls. For a one-day prediction, observations within 1000 miles of the hurricane center will normally suffice; weather events in the central and northern United States and in the higher latitudes of the Atlantic Ocean are of particular importance. For a two-or-three-day forecast current weather events in temperate and polar zones over the whole Pacific and Atlantic Oceans, in addition to North America, must be taken into account.

Various researches to develop prediction techniques for hurricanes from large-area studies have been underway for numerous years and are still being pursued. At present, the degree in refinement of calculations has well outrun the accuracy and density of the observations on which the calculations are based. In hurricane forecasting, a large number of high-quality oceanic observations are indispensable because calculations must take into account the current state of the atmosphere on all

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sides of a storm. Currently, these oceanic observations do not exist in nearly sufficient quantity, especially in the upper atmosphere. It is possible to gather such data within reasonable cost limits by means of aircraft, at least for hurricanes that are a potential threat to the continent within two days of their position at any moment. Until such observations are secured, it is unlikely that the error in 36-hour prediction will be reduced to a 50 mile limit.

On a longer time scale of up to 5 days researchers are being pursued to develop prediction methods useful as a general guide on the path of the hurricane. No scientific basis exists for predicting months in advance when and where a hurricane will form or enter the coast.

The subject of possible modification of a hurricane's path or intensity is receiving attention by the profession, but up to the present no conclusive experiments have been performed.

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